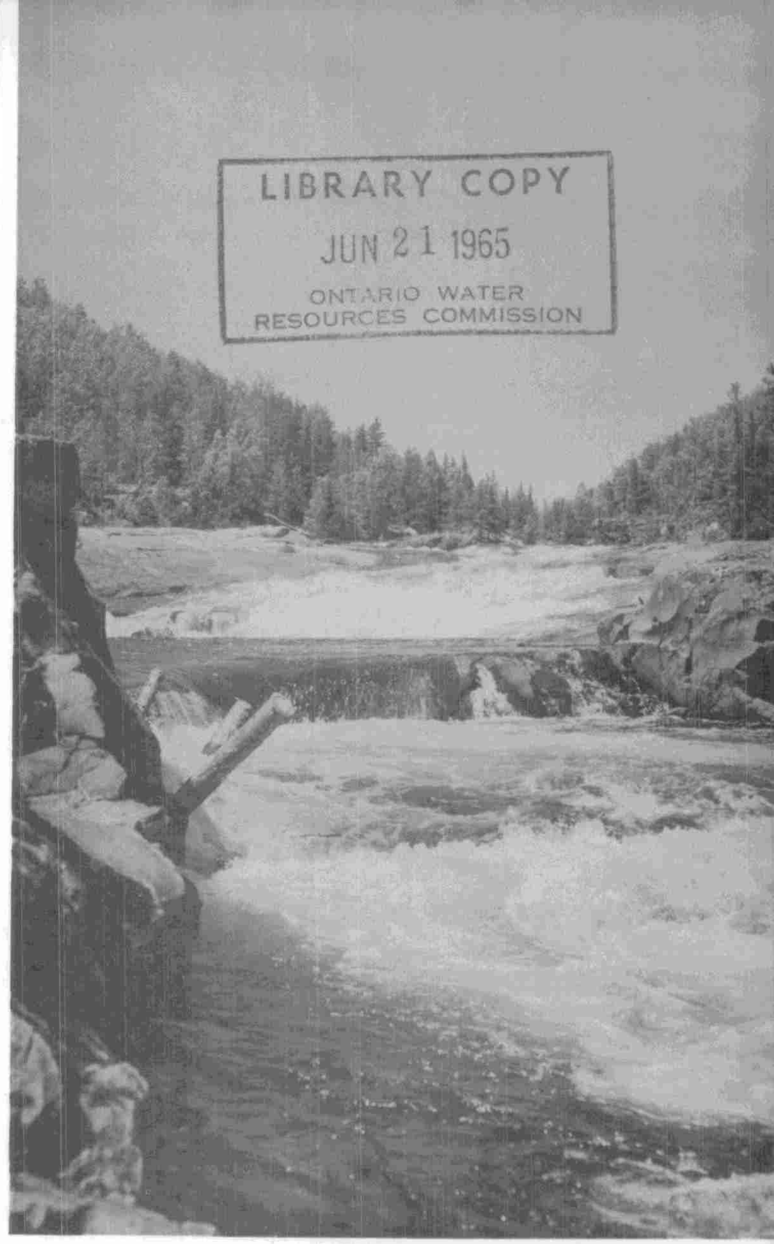
Dunnville Regional Water Treatment Plant



1963 Annual Report

Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Dunnville Regional
Water System Advisory Committee.

Gentlemen :

I am pleased to submit, for your information, the 1963 Annual Operating Report of the Dunnville Regional Water Treatment Plant, OWRC Project No. 58-W-17, which has been prepared by our Division of Plant Operations.

We are grateful for the kind cooperation which you and your staff have extended to our Operations staff throughout the year. We look forward to a continuing close association with you in our mutual endeavour to provide a safe and adequate water supply for the residents of your municipalities.

Yours very truly,

D. S. Caverly

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Dunnville Regional Water Treatment Plant, OWRC Project No. 58-W-17 for 1963.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer,
Director,
Division of Plant Operations.

foreword

This report is designed to present the highlights of the operation of these works during 1963. Trends in flows and other operating data can be extremely useful in the development of necessary long range enlargement and improvement programs.

In addition to the activities reported herein, much unrecorded effort has contributed to the success of this operation. The two industries and the Town, through representatives on the Local Advisory Committee, have given valuable assistance in reviewing salary schedules, detailed operating budgets, personnel problems, flow patterns, and major maintenance problems.

The Division of Plant Operations has provided direction to the field staff in administrative procedures, quality control, maintenance schedules, equipment inspection and purchase supervision. A number of other Divisions of the Commission have been of service. The Division of Construction has offered helpful advice on equipment selection and renovation problems. The Division of Sanitary Engineering has maintained, through its District Engineering staff, a keen interest in the operation and has made a number of constructive recommendations. Its operator training courses have been very helpful. The Division of Finance has processed many payrolls, purchase orders and invoices dealing directly with this project. The Commission Personnel Director has been most helpful in the counselling of personnel problems.

The excellent cooperation of all of these groups is gratefully acknowledged.

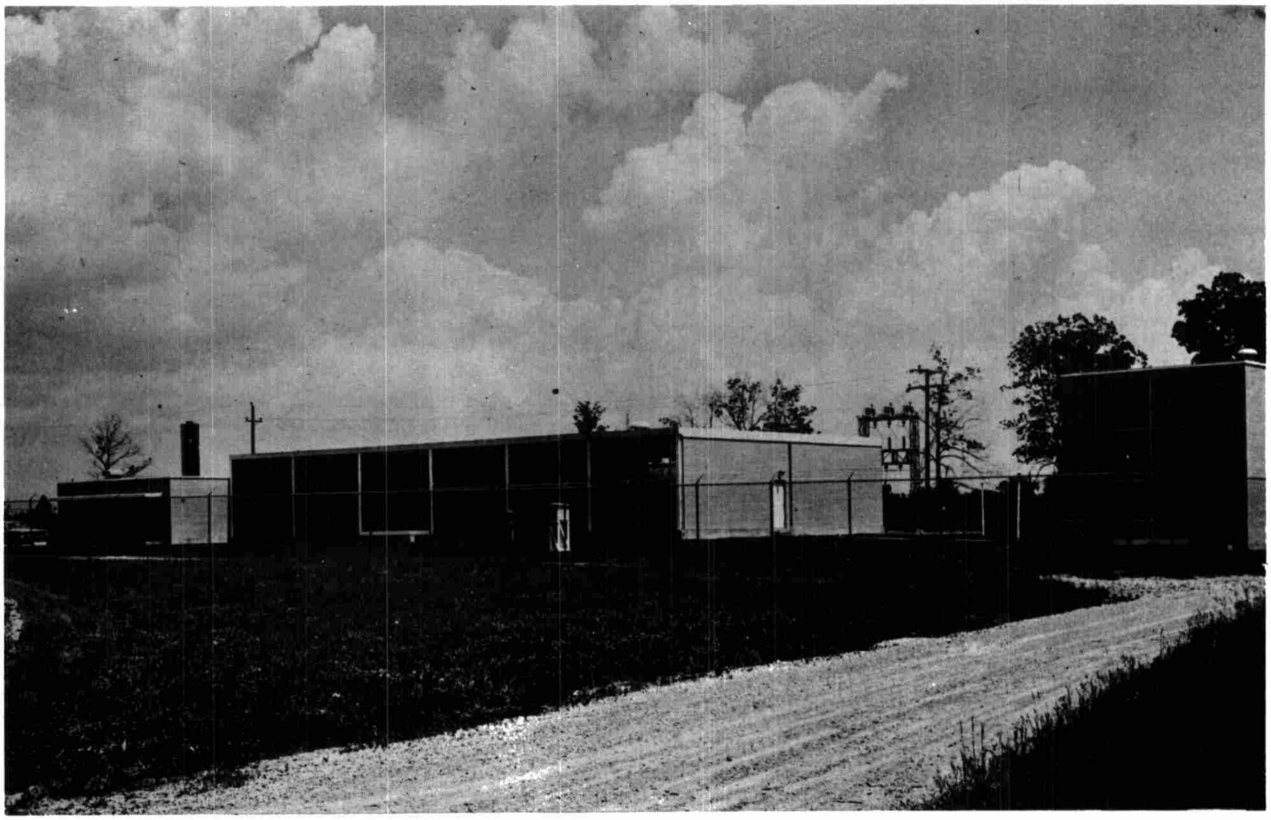
B. C. Palmer,
Director,
Division of Plant Operations

DIVISION OF PLANT OPERATIONS

contents

C. W. Perry
Assistant Director
A. C. Beattie
Regional Supervisor
P. J. Osmond
Operations Engineer

DUNNVILLE REGIONAL WATER TREATMENT PLANT



OPERATED FOR

THE TOWN OF DUNNVILLE
SHERBROOKE METALLURGICAL COMPANY LIMITED
THE ELECTRIC REDUCTION COMPANY LIMITED

BY

THE ONTARIO WATER RESOURCES COMMISSION

1957 to 1963 History

INCEPTION

In 1957, the Town of Dunnville and the Ontario Water Resources Commission initiated plans for the construction of a modern water treatment plant.

In 1958, two industries, the Sherbrooke Metallurgical Company Limited and the Electric Reduction Company Limited, began expanding in the Port Maitland area. Both of these industries required large amounts of water for their manufacturing process.

The Commission coordinated the needs of the town and industries and the firm of Canadian British Engineering Consultants, Toronto, were enlisted to design the necessary facilities.

CONSTRUCTION

Schwenger Construction Limited, Hamilton, began construction in October 1959 and by August 1960 the Division of Plant Operations took over partial operation of the plant. Complete operation of the project was achieved in November 1960.

TOTAL COST

$2,585,688.00.

Project Staff

Reg Neff,
Superintendent

Assistant Superintendent
R. Root

Operators:

O. McLaughlin
A. Clark
J. Cowan
A. Miller
R. Martineau

Mr. R. Root was appointed to the newly created position of Assistant Superintendent during the past year.

The plant staff was again supplemented by a casual labourer who assisted with various duties not associated with the actual operation of the plant such as painting and grounds maintenance, etc.

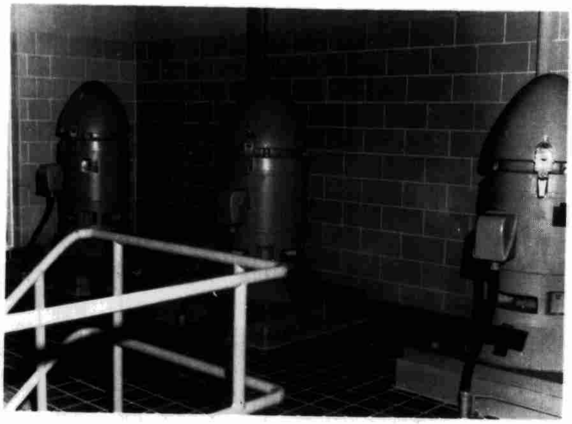
Both an Algae Identification Course and a Basic Water Works Course were attended by plant staff during 1963. Mr. O. McLaughlin attended the algae course and is now making routine surveys of the quantity and types of algae present in the raw water. This information is submitted to the OWRC, Biology Department, which is presently compiling valuable information on this pressing problem. Mr. A. Clark and Mr. R. Root attended the Basic Water Works Course and obtained satisfactory standing.

Mr. R. Neff, Plant Superintendent, attended the 1963 Chief Operators Conference sponsored by the Commission.

Description of Project

INTAKE

The intake crib is located 1,300 feet out in Lake Erie in 25 feet of water. The raw water flows by gravity through the intake pipe which is laid in a rock cut on the lake bottom and is supported on sand bags filled with a mixture of sand and cement. The intake pipe terminates in the low lift pumping station pump wells.



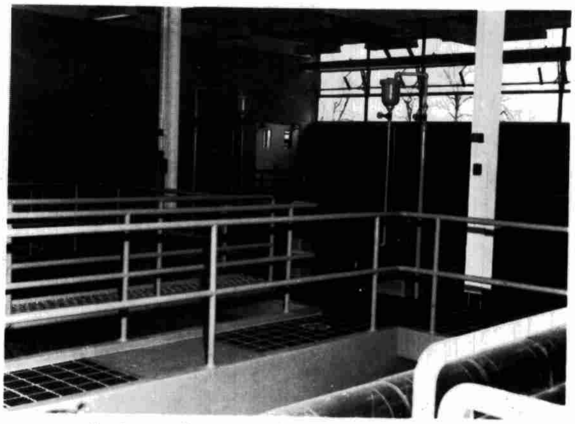
LOW LIFT STATION

Just prior to entry to the pump wells, the raw water is screened by twin screens which may be removed one at a time for cleaning. The purpose of the screens are to remove any debris which would damage the low lift pumps.

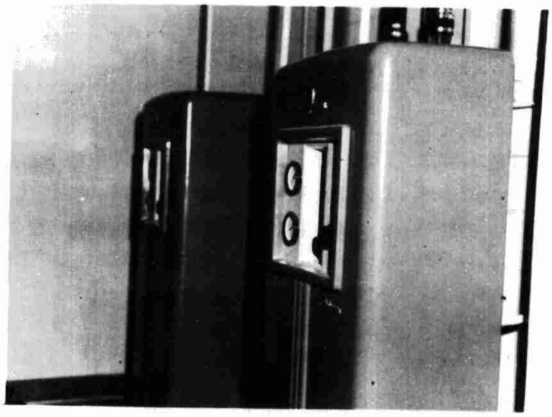
The raw water is pumped to the microstrainers by three vertical turbine deep well pumps. These pumps are controlled by electrodes located in the clear well of the high lift station. At peak demand periods, all three pumps can operate in parallel.

MICROSTRAINERS

Upon reaching the high lift station, the raw water passes through the microstrainers. A microstrainer consists of



a revolving drum the circumference of which is covered with an extremely fine woven stainless steel cloth. The microstrainers remove most of the algae and other foreign material from the raw water as it passes through the fabric from the inside of the drum to the outside. The strained water then overflows from the microstrainer compartment into an effluent channel which flows into one of two clear wells. The microstrainer fabric is continually flushed by treated water from a wash water pump which has an intake in the microstrainer effluent channel.



CHLORINATION

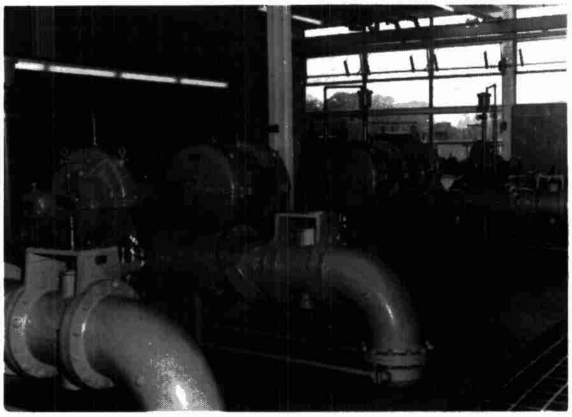
Effluent from the microstrainers is stored in two clear wells located directly beneath the high lift pumping station. It

is here that chlorine is added for disinfection. The chlorine is fed through proportional feed chlorinators the amount being determined by the rate of flow of raw water from the low lift station. Enough chlorine is added to maintain a slight residual in the water when it reaches the consumer's outlets.

The chlorine equipment is installed in an isolated room in the high lift pumping station with the chlorine being stored in one ton cylinders in an adjacent roofed area. The cylinders are usually delivered to the plant in groups of seven and are moved as required from the storage area to the chlorinator room using a chain hoist sliding on a crane rail.

DISTRIBUTION

Treated water is drawn from the clear wells and distributed to Dunnville and



Port Maitland using seven high lift pumps. The pumps are controlled by flow. As the flow increases, more pumps are brought into service.

A 36 ft. diameter transite main serves the Port Maitland industrial complex and a 16 inch diameter transite main supplies the Town of Dunnville with its requirements.

Design—Data

DESIGN CAPACITY OF PLANT

20.5 MGD.

INTAKE

48" asbestos bonded corrugated metal.

SCREENING FACILITIES

Four removeable screens 5'6" square having 3/8" openings.

Each screen can be removed for cleaning by individual 51" rocket hoists by David Round & Son.

LOW LIFT PUMPS

Three Byron Jackson vertical turbine pumps. Each pump is rated at 5700 GPM @ 38 ft. TDH.

Three Westinghouse encapsulated line start induction motors. Each motor is rated at 75 HP.

MICROSTRAINERS

Siz 10 ft. long x 10 ft. diameter machines as manufactured by Glenfield & Kennedy. All machines are equipped with Mark I fabric having a maximum opening of 35 microns.

WASH WATER PUMPS

Two Babcock-Wilcox & Goldie McCulloch centrifugal pumps rated at 500 GPM @ 100 ft. TDH.

Two Westinghouse encapsulated life-line motors rated at 20 HP.

CLEAR WELLS

Two compartments having a total capacity of 200,000 Imperial gallons. Detention time at 20.5 MGD = 18.25 minutes.

HIGH LIFT PUMPS

NO. 1 DUNNVILLE

One Wheeler Economy Pump - 1200 GPM @ 135 ft. TDH driven by a 50 HP English electric motor.

Two Wheeler Economy Pumps - 1440 GPM @ 230 ft. TDH.

NO. 2 PORT MAITLAND

Four horizontal drive Worthington pumps. These pumps are rated such that when any three are operating in parallel, they will produce 4,000 GPM each at 220 ft. discharge pressure.

Three pumps are driven by 350 HP Associated Electrical Industries constant speed motors. The fourth pump is driven by a 350 HP synchronous motor by English electric connected through a Dynamatic Eddy Current Coupling.

CHLORINATION

Two Wallace & Tiernan Series A-711 variable vacuum control chlorinators capable of metering 2,000 lbs. of chlorine per day.

Storage facilities are provided for 15 one ton cylinders.

DISTRIBUTION SYSTEM

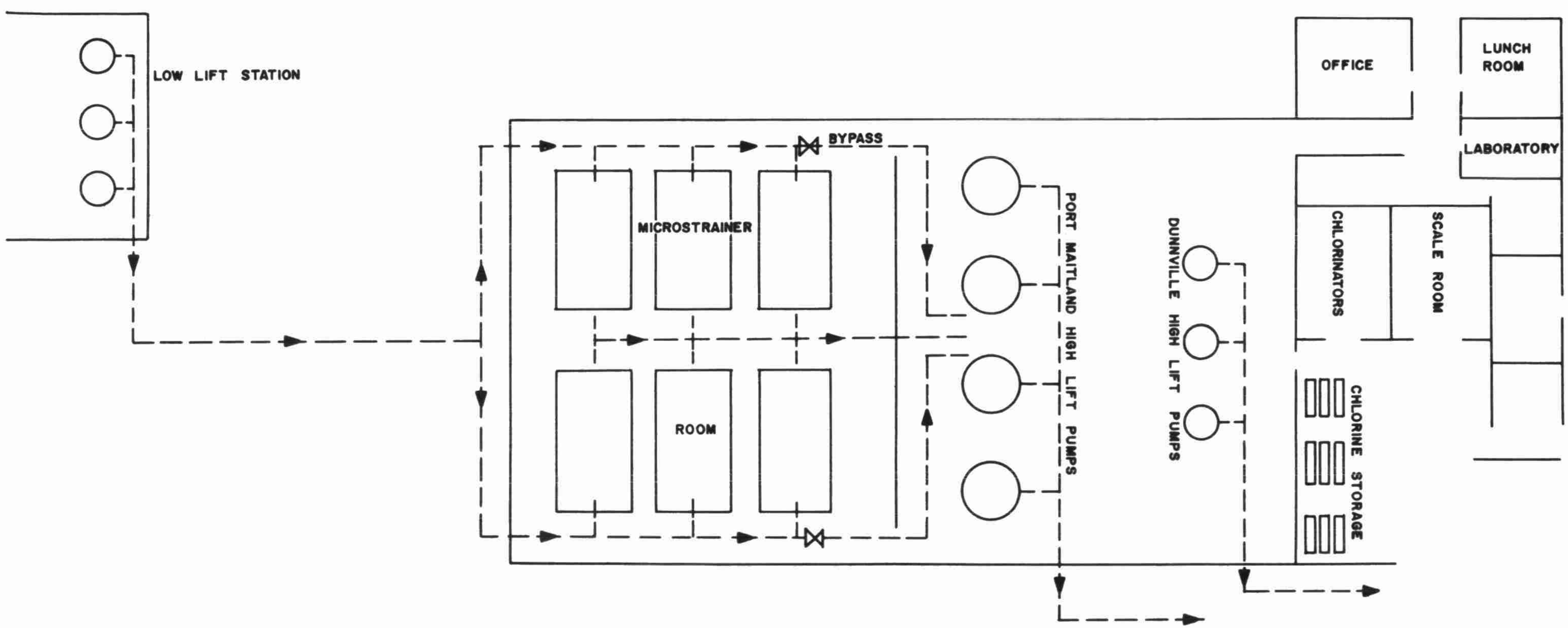
TO TOWN OF DUNNVILLE

23,000 feet of 16" diameter asbestos cement pipe which supplies a maximum of 2,400 GPM to either the filtration plant or directly to the town distribution system.

TO PORT MAITLAND

20,000 feet of 36" diameter asbestos cement pipe pumped directly to the industrial distribution system in Port Maitland.

DUNNVILLE WATER TREATMENT PLANT



Process Data

GENERAL

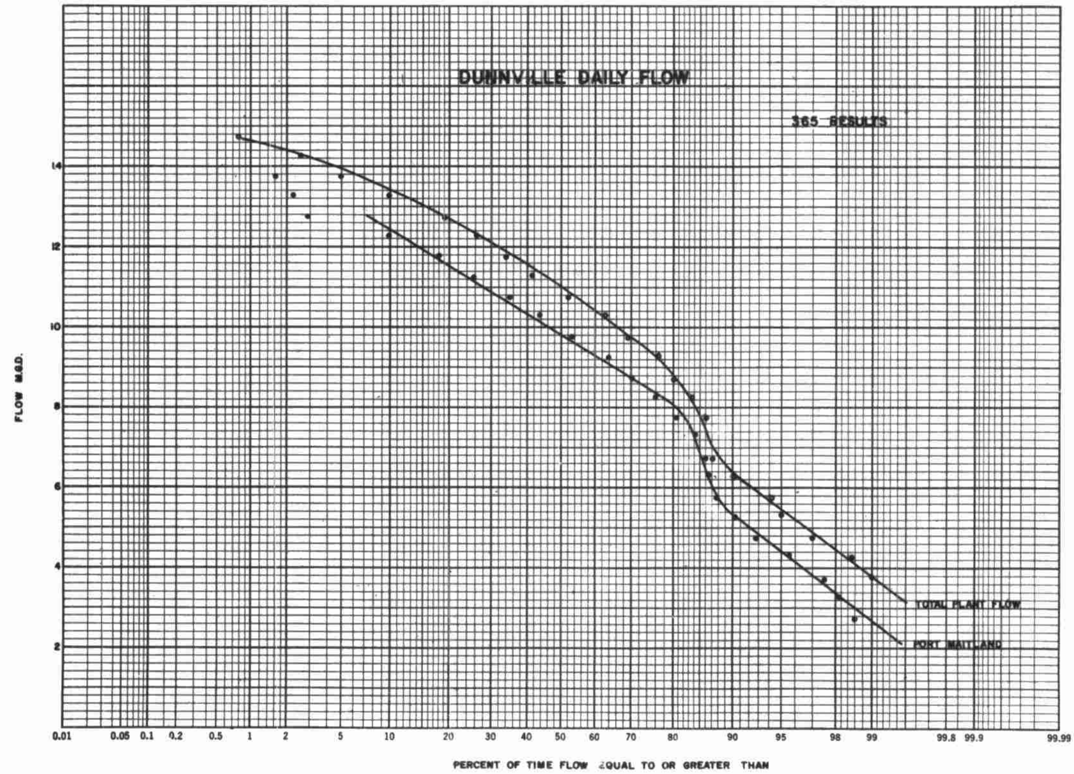
The treatment of water at the Dunnville plant consists of microstraining to remove such things as algae and gross solids and disinfection by the addition of chlorine. The following data provides information regarding the output of the plant, the quality of the raw water, the quality of the treated water and chlorine dosages necessary to maintain safe water. The quality of the water is discussed using such terms as filterability and turbidity. An effort is made to define the meaning of these terms and graphs have been drawn to indicate the frequency of occurrence of various readings.

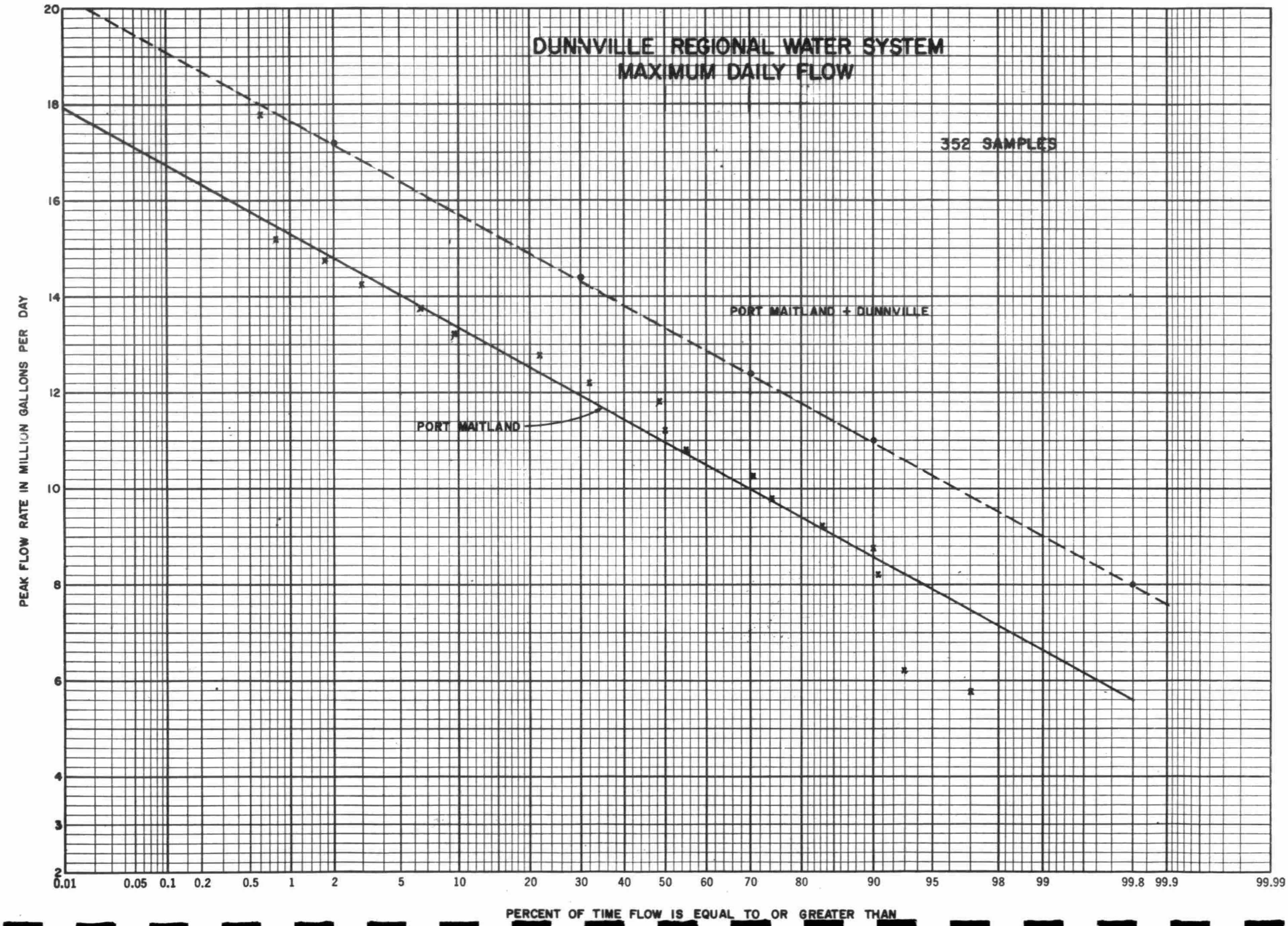
Blending, or the mixing of strained and raw water, was necessary for short periods of time during 1963. This condition was due in part to the heavy demand on this plant during peak periods and, in part, to the poor quality of the raw water. Blending was required for a total of 220 hours or 2.5% of the time and but for 14 hours in May occurred in the months of July and August.

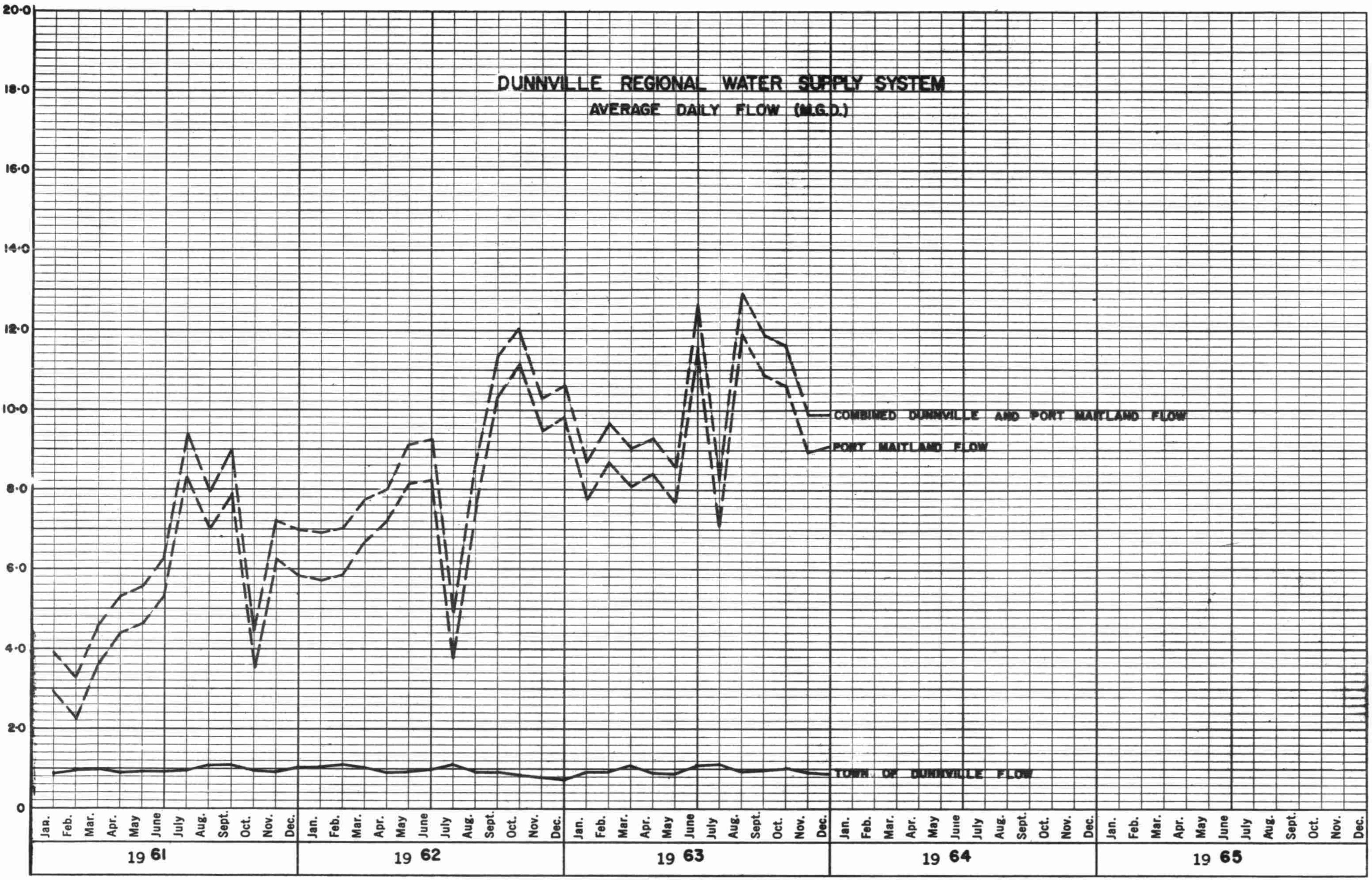
FLOW

During 1963, a total of 3,726.94 million gallons of water were pumped from the Dunnville Water Treatment Plant. August was the peak month at the plant with a total monthly flow of 360.33 million gallons. The Town of Dunnville had a peak monthly flow of 36.15 million gallons in July and the Port Maitland industries required a maximum monthly flow of 370.00 million gallons in August.

The daily average plant output increased substantially from 8.81 million gallons in 1962 to a daily average of 10.26 million gallons in 1963.



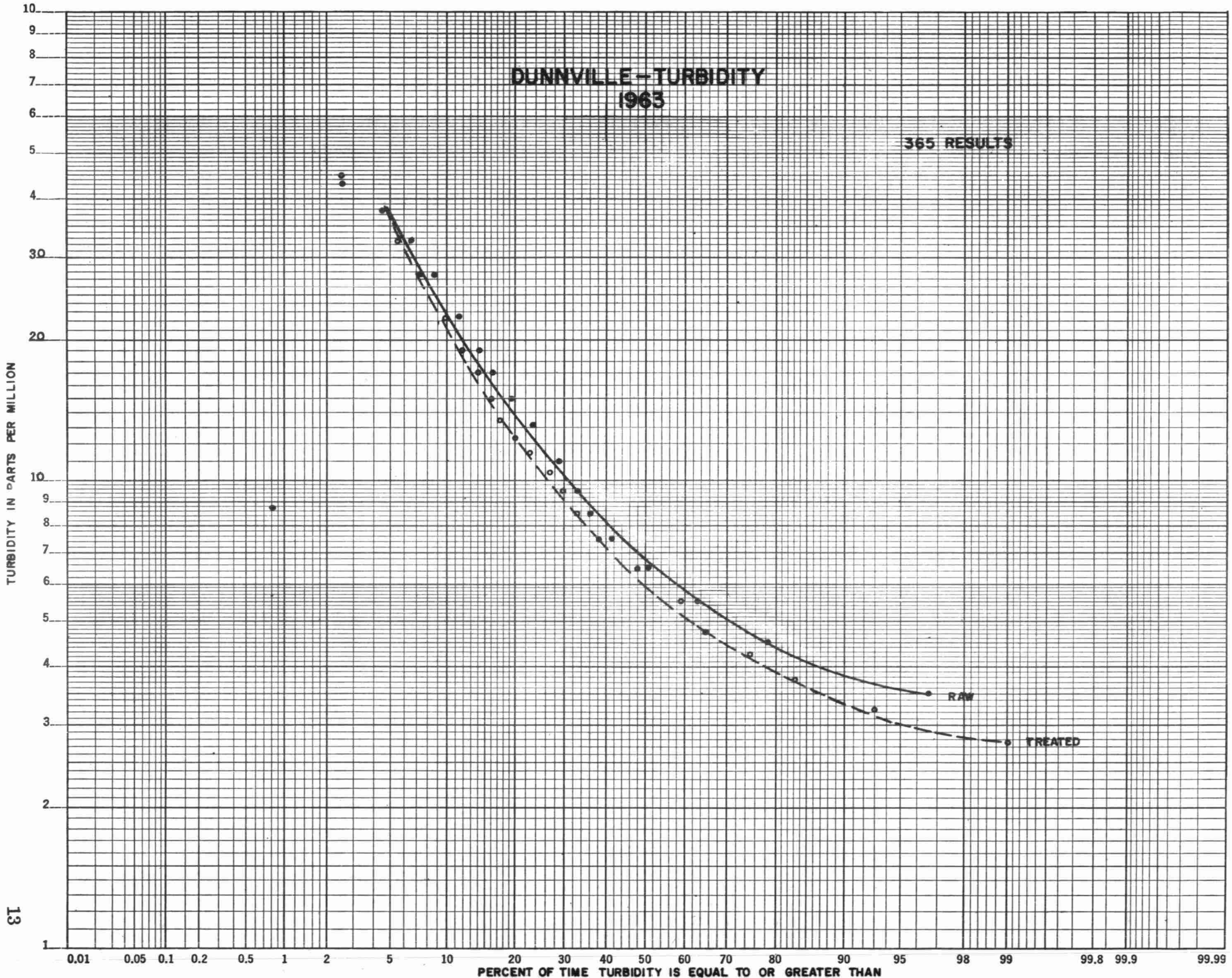

DUNNVILLE REGIONAL WATER SYSTEM
MAXIMUM DAILY FLOW
352 SAMPLES
PORT MAITLAND + DUNNVILLE
PORT MAITLAND
PEAK FLOW RATE IN MILLION GALLONS PER DAY
20
18
16
14
12
10
8
6
4
3
2
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

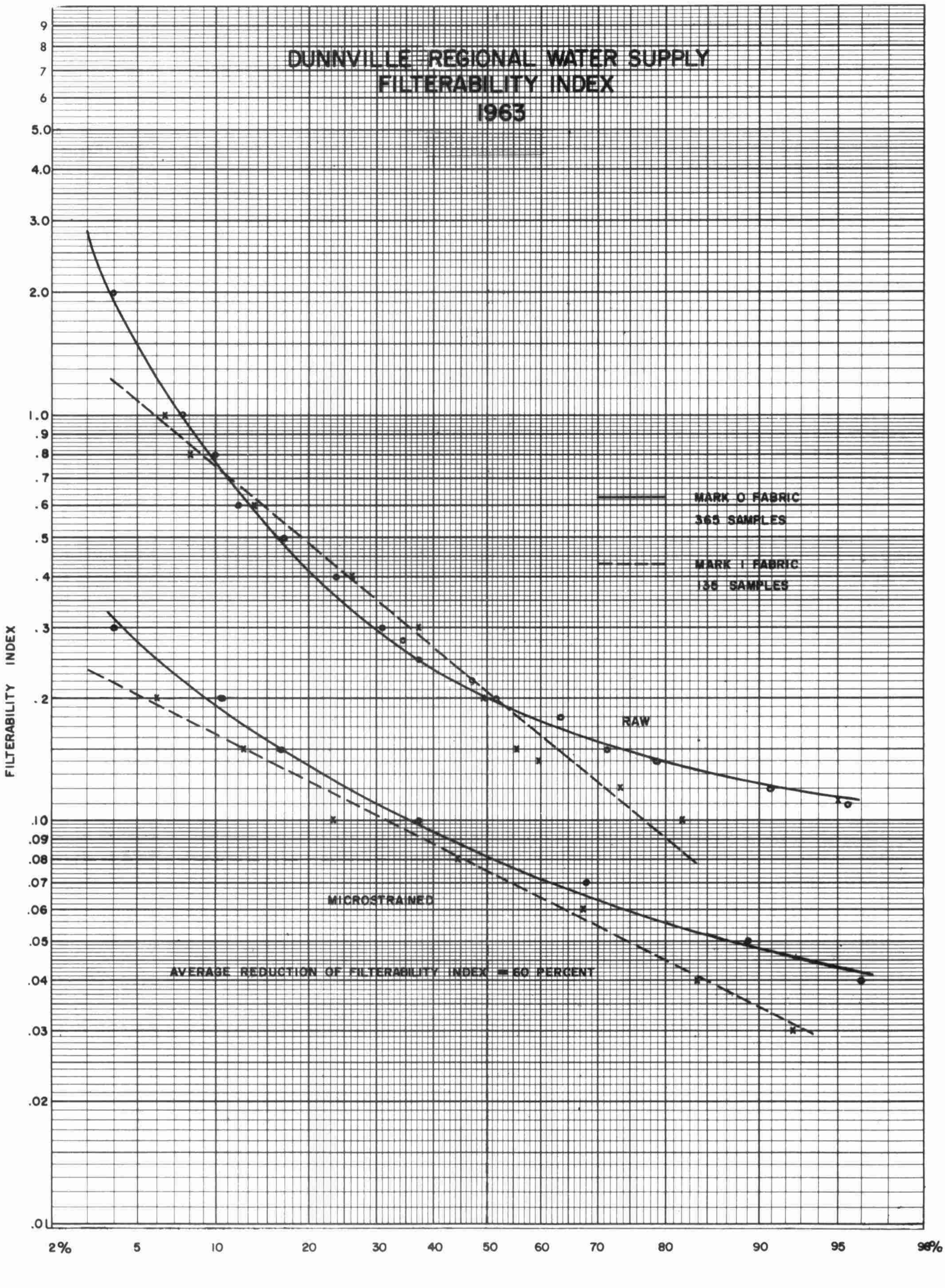

DUNNVILLE REGIONAL WATER SUPPLY SYSTEM
AVERAGE DAILY FLOW (M.G.D.)
COMBINED DUNNVILLE AND PORT MAITLAND FLOW
PORT MAITLAND FLOW
TOWN OF DUNNVILLE FLOW
20·0
18·0
16·0
14·0
12·0
10·0
8·0
6·0
4·0
2·0
0
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
19 61
19 62
19 63
19 64
19 65

1963

MONTHLY FLOWS

MONTH	TOTAL FLOW (MG)	DUNNVILLE TOWN (MG)	PORT MAITLAND (MG)
JANUARY	270.672	29.132	241.540
FEBRUARY	270.936	26.996	243.940
MARCH	281.155	32.945	248.210
APRIL	278.775	26.705	252.070
MAY	265.524	26.704	238.820
JUNE	380.431	31.791	348.640
JULY	255.782	36.152	219.630
AUGUST	399.182	29.182	370.000
SEPTEMBER	357.027	29.887	327.140
OCTOBER	360.334	32.144	328.190
NOVEMBER	297.238	27.977	269.261
DECEMBER	309.879	26.869	283.010
TOTAL	3726.935	356.484	3370.451
AVERAGE	310.578	29.707	280.871
% OF TOTAL		9.6	90.4


DUNNVILLE—TURBIDITY
1963
365 RESULTS
RAW
TREATED
TURBIDITY IN PARTS PER MILLION
PERCENT OF TIME TURBIDITY IS EQUAL TO OR GREATER THAN
10
9
8
7
6
5
4
30
20
10
9
8
7
6
5
4
3
2
1
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99


DUNNVILLE REGIONAL WATER SUPPLY
FILTERABILITY INDEX
1963
MARK O FABRIC
365 SAMPLES
MARK I FABRIC
135 SAMPLES
RAW
MICROSTRAINED
AVERAGE REDUCTION OF FILTERABILITY INDEX = 60 PERCENT
FILTERABILITY INDEX
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN

TURBIDITY

Turbidity is a measurement of the amount of visible material in suspension in a water supply. It is usually caused by silt, clay on algae particles suspended in the water sample. The Dunnville plant is designed to remove algae from the water taken from Lake Erie by microstraining. As indicated on Page No. 13, the microstrainers provide some reduction in turbidity. As algae is predominant in the summer months, the most marked reduction in turbidity occurs in this period. The unit for turbidity as expressed on the graph is parts per million. The U.S. Public Health Standard for drinking water specifies a limit of 10 parts per million. At the Dunnville plant, the treated water met this standard 74% of the time.

FILTERABILITY

The term filterability denotes the ease with which water may be passed through a filter medium. The filterability index has been developed in connection with microstrainers and their ability to filter various quantities of water per unit of time. For the purpose of this report, the filterability index, as shown on Page No. 14, may be interpreted as an indication of the quality of the water. Filterability bears a relationship to turbidity in that the greater the turbidity of the sample, the higher the filterability index. As the filterability index increases, the water becomes increasingly difficult to filter and the capacity of the microstrainers is reduced. During the summer when algae is abundant, or when the lake conditions are quite rough and choppy, the filterability index will be greater and head losses through the microstrainers will build up more rapidly.

BACTERIOLOGICAL ANALYSIS

A total of 114 samples for bacteriological analysis were submitted to the OWRC Laboratory during 1963. Of these samples, 37 were of the raw water as taken from the Dunnville plant low lift station and 77 were of the treated water as collected from the Sherbrooke Metals plant, the end of the main at the Dunnville P. U. C. and Grandview School in Dunn Township. Of the 77 samples of treated water, 73 were classed as grade "A" or satisfactory water, 3 were classed as Grade "B" or water where the pollution present is not sufficient to regard it unfit for drinking and one classed as grade "C" or unsafe for human consumption. As a close check is kept on the chlorine residual in the treated water leaving the plant, it was felt that the sampling procedure was at fault in the case of the class "C" result.

CHEMICAL ANALYSIS

A total of 125 samples were submitted to the OWRC Laboratory for chemical analysis during 1963. Half of these samples were of the raw water and half were of the treated water. There is virtually no change between the treated and raw water due to the dissolved nature of the chemicals and the yearly average values as listed below may be considered as applicable to either raw or treated water. Also included in the table below are normally accepted standards for good quality water.

Description	Hardness As $CaCO_3$ (PPM)	Alkalinity As $CaCO_3$ (PPM)	Iron As Fe (PPM)	Chloride As Cl (PPM)	pH at Lab	Colour in Hazen Unit	Phenols in (ppb)	Sulphates as SO_4 (PPM)
Standards	<100	30 to 100	<.03	<250	6.7 to 8.5	<15	<2	<250
(Yearly Avg.) Dunnville Plant	135	104	0.36	24	8.1	< 5	3	27

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	1.20	.60	3259
FEBRUARY	1.10	.60	3972
MARCH	1.20	.60	3328
APRIL	1.20	.60	3458
MAY	.80	.30	2146
JUNE	.77	.30	2928
JULY	.90	.30	2152
AUGUST	1.09	.46	4483
SEPTEMBER	,99	.41	3656
OCTOBER	.94	.40	3410
NOVEMBER	.90	.40	2704
DECEMBER	.94	.40	2700
TOTAL			37196
AVERAGE	1.00	.447	3099.7

COMMENTS

Chlorination of water is required for disinfection of disease bacteria. A beneficial side result is the elimination or partial elimination of undesirable tastes and odours. Post-chlorination, or the addition of chlorine after all other treatment, is used to obtain a free residual after 15 minutes detention of 0.4 parts per million.

During 1963, an average dosage of 1 part per million was required to provide an average residual of .45 parts per million.

1963

Total Operating Costs

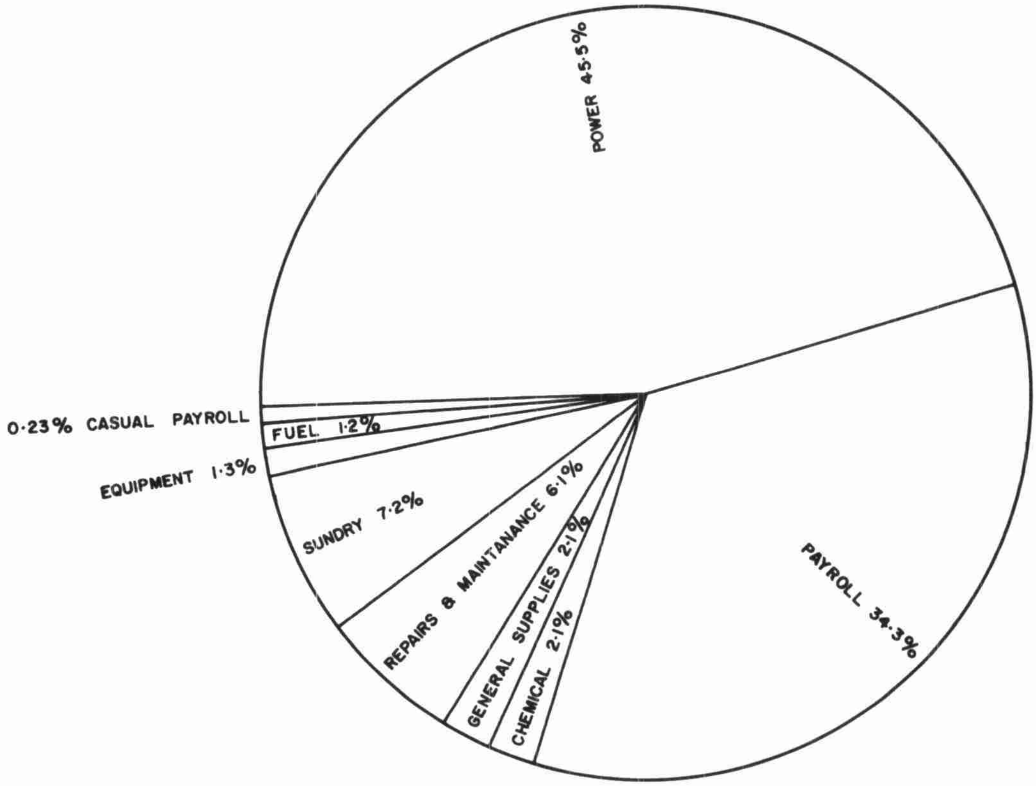
PLANT **MONTHLY**

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	7,124.54	2,804.38		227.62	3,627.66	80.13	280.55		31.76	72.45	
FEB											
MARCH	9,826.43	2,341.66		415.22	3,461.11		79.49		2,706.61	822.34	
APRIL	6,813.33	2,345.50		264.76	3,386.29	24.81	113.92	272.91	261.61	408.29	
MAY	7,083.80	2,440.13		21.92	3,424.42	208.29	72.09	107.08	145.06	421.97	
JUNE	7,651.64	2,205.86			3,267.55	1,002.70	268.33	268.68	499.65	116.95	
JULY	9,049.45	3,567.54	215.38	8.98	3,752.54	(19.80)	67.30	541.58	858.21	66.70	
AUG	6,458.19	2,456.53			3,454.35	(27.54)	176.44	27.24	57.27	213.92	
SEPT	7,388.80	2,471.66			4,278.46	49.44	96.99		306.06	186.19	
OCT	9,625.21	2,471.66			3,854.76	1,020.10	180.41		345.95	1,702.33	
NOV	9,241.64	2,548.91		58.72	3,862.07	39.60	150.96		156.78	2,424.60	
DEC	7,426.53	4,701.73		112.75	3,504.32	(1,818.00)	297.49	13.97	375.15	239.12	
TOTAL	95,458.82	32,738.53	215.38	1,109.96	43,536.96	1,980.71	1,971.65	1,231.46	5,835.86	6,838.31	

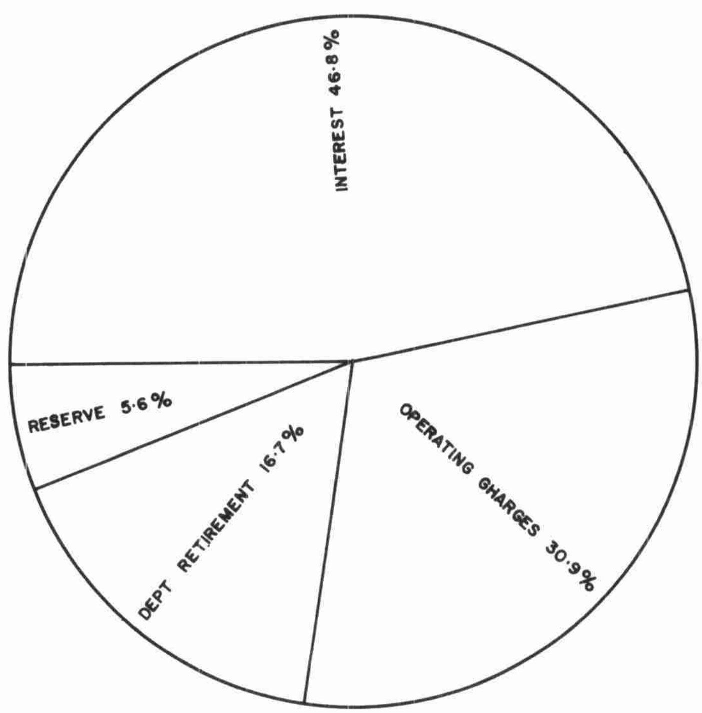
PLANT **YEARLY**

YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER CAPITA PER YEAR
1961	2,245,838	71,428.00	3.18	
1962	3,214.853	85,564.88	2.66	
1963	3,726,935	95,458.82	2.56	

DUNNVILLE
1963 OPERATING COSTS



TOTAL ANNUAL COST



SUMMARY

This report has provided information pertaining to the operation of the Dunnville Regional Water Supply System during the past year paying particular attention to flows, treatment and costs.

The average daily flow of 10.26 million gallons in 1963 was an increase of 16.5% over the 1962 average daily flow. Peak periods during the summer required some blending of raw and treated water. However, steps are being taken in 1964 to avoid this situation. All the microstrainers are being equipped with Mark I fabric replacing the original Mark "O" fabric. This will result in increased capacity on these units and longer operational periods between cleanings.

Supervision and technical assistance by head office engineers and technicians together with the excellent work of the plant staff, resulted in a well operated and maintained plant throughout the year. The cost per thousand gallons has decreased consistently since the start of operation being 3.18 in 1961, 2.66¢ in 1962 and 2.56¢ in 1963 and provides a yardstick for determing the efficiency of operation.

The coming year will see all the microstrainers equipped with Mark I fabric and the alteration of the Dunnville line to allow integration with the Port Maitland line as a constant pressure system. Extensive outside painting is also planned for the summer of 1964.

Total 1963 Costs

The total cost of the project as charged to the Town of Dunnville, the Electrical Reduction Company Limited and the Sherbrooke Metallurgical Company Limited was as follows:

Operating	$ 95,458.82
Debt Retirement	$ 51,714.00
Reserve	$ 17,465.00
Interest	$ 144,541.66
TOTAL	$ 309,179.48

The proportioning of these costs among the three participants was as follows:

	Town of Dunnville	Electrical Reduction	Sherbrooke Metallurgical	Total
Operating	$ 17,678.97	$ 42,421.90	$ 35,357.95	$ 95,458.82
Debt Retirement	10,709.00	22,512.00	18,493.00	51,714.00
Reserve	3,616.34	7,603.11	6,245.55	17,465.00
Interest	30,715.10	62,080.64	51,745.92	144,541.66
TOTAL	$ 62,719.41	$ 134,617.65	$ 111,842.42	$ 309,179.48

Note: The amount 1963 was $56,578.68.

Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION
801 BAY ST. TORONTO 5